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Proceedings of the Annual Meeting of the Cognitive Science Society

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Journal

Proceedings of the Annual Meeting of the Cognitive Science Society, 38(0)

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Publication Date

2016

Peer reviewed

The Sapir-Whorf Hypothesis and Probabilistic Inference: Evidence from the Domain of Color

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Keywords: Sapir-Whorf hypothesis; linguistic relativity; color memory; category effects; probabilistic inference.

The Sapir-Whorf hypothesis holds that our thoughts are shaped by our native language, and that speakers of different languages therefore think differently. This hypothesis is controversial in part because it appears to deny the possibility of a universal groundwork for human cognition, and in part because some findings held to support it have not reliably replicated. We argue that considering this hypothesis through the lens of probabilistic inference has the potential to resolve both issues, at least with respect to certain prominent findings concerning color cognition.

We cast color memory as inference under uncertainty, and explore this idea using a version of the category adjustment model of Huttenlocher et al. (1991) (see also Bae et al., 2015; Persaud & Hemmer, 2014). The model holds that color memory involves the probabilistic combination of evidence from two sources: a fine-grained representation of the specific color seen, and the language-specific category in which it fell (e.g. *green*). Both sources of evidence are represented in a universal perceptual color space, yet their combination yields language-specific bias patterns in memory. The model predicts that such category effects will be strongest when perceptual information is uncertain. It thus has the potential to explain the mixed pattern of replications of Whorfian effects in the literature (e.g. Brown et al., 2011; Wright et al., 2015): non-replications could result from high perceptual certainty.

We first describe the results of an experiment showing language-consistent biases in color memory in English speakers, and stronger bias when perceptual information is uncertain, consistent with this model, and replicating recent findings (Bae et al., 2015). We then show that the same model also accounts for existing data on cross-language differences in color memory in speakers of English, Berinmo, and Himba (Roberson et al., 2000; 2005). Finally, we show that this model accounts for existing cross-language data on within-category discrimination (Hanley &

Roberson, 2011). We suggest that these ideas may help to clarify the debate over the Sapir-Whorf hypothesis.

Acknowledgments

We thank Paul Kay and Charles Kemp for their comments. This research was supported by NSF under grants DGE-1106400 (EC) and SBE-1041707 (YX, TR).

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